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ABSTRACT

Friction was measured at 25°C for steel sliding on polytetrafluoroethylene (TFE), a copolymer of tetrafluoroethylene and hexafluoropropylene (FEP), three high-density polyethylenes (HDP), and two low-density polyethylenes (LDP) at a velocity of 0.01 cm/sec and with a load of 1000 grams. The static coefficient of friction (μ_s) with a clean steel slider for all the polymers and the kinetic coefficient of friction (μ_k) for LDP are of the order predicted by the adhesion theory. The experimental values of μ_k are much smaller than the calculated values with TFE, FEP, and HDP because of the low specific adhesion between these polymers and their films which have transferred to the steel slider. The value of μ_k for FEP was found to be greater than that of TFE by a factor of three. Similarly, μ_k for LDP was three times that of HDP. These large differences are explained by the differences in the nature of the transferred polymer films and real areas of contact. All these polymers are potentially excellent dry-film lubricants when used as thin films on a hard backing.

Friction was also determined for FEP as a function of the load in the range 100 to 10,000 grams. Static friction was not proportional to the load and μ_s increased rapidly as the load was decreased below 1000 grams. It was concluded that the real area of contact was not proportional to the load and that the deformation of contacting asperities was not completely plastic.

PROBLEM STATUS

This is an interim report; work on this problem is continuing.

AUTHORIZATION

NRL Problem CO2-03
Project RR 007-08-44-5501

Manuscript submitted March 13, 1963.

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Friction was also determined for FEP as a function of the load in the range 100 to 10,000 grams. Static friction was not proportional to the load and μ_s increased rapidly as the load was decreased below 1000 grams. It was concluded that the real area of contact was not proportional to the load and that the deformation of contacting asperities was not completely plastic.

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